

REVIEW PLAN

**FARGO-MOORHEAD METRO
NORTH DAKOTA AND MINNESOTA
FLOOD DAMAGE REDUCTION
FEASIBILITY STUDY**

St. Paul District

December 9, 2008

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September 27, 2008

1. General. This review plan, in coordination with the study project management plan, was developed in accordance with EC 1105-2-410, "Review of Decision Documents," dated 22 August 2008. The EC establishes procedures to ensure the quality and credibility of Corps decision documents.

2. Project Description.

a. Overview: The Fargo-Moorhead Metro Feasibility Study is slated to begin in the Fall of 2008 with the execution of a Feasibility Cost Sharing Agreement between the St. Paul District US Army Corps of Engineers and the City of Fargo, North Dakota and the City of Moorhead, Minnesota (sponsors). The sponsors will provide 50% of all study costs through non-federal cash and in-kind contributions. The Corps of Engineers funds the remaining 50% of study costs. The study is currently estimated to cost \$5,318,000. The study was recommended in the Fargo-Moorhead Metropolitan Area Reconnaissance Study, Section 905(b) (WRDA 1986) Analysis, North Dakota and Minnesota, dated March 2008 and is authorized by a 30 Sep 1974 Resolution of Senate Committee on Public Works:

"RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE, That the Board of Engineers for Rivers and Harbors be, and is hereby, requested to review reports on the Red River of the North Drainage Basin, Minnesota, South Dakota and North Dakota, submitted in House Document Numbered 185, 81st Congress, 1st Session, and prior reports, with a view to determining if the recommendations contained therein should be modified at this time, with particular reference to flood control, water supply, waste water management and allied purposes."

Funds to conduct the feasibility study were provided in the Consolidated Appropriations Act, 2008, approved 26 December 2007 (**Public Law 110-161**). The study will result in the development of a feasibility report which will identify if there is a federally implementable flood damage reduction project. This project will require congressional authorization.

b. Purpose: The Fargo-Moorhead Metro Feasibility study will develop a feasibility report focused on flood damage reduction for the project area. The study will assess alternative measures including but not limited to non-structural measures (flood-proofing or flood-plain evacuation), levees, floodwalls, diversion channels, and bridge modifications. The project is a single purpose flood risk management project with ecosystem and recreational objectives.

The study area is the Fargo-Moorhead metropolitan area and communities in the vicinity. Fargo-Moorhead is located on the Red River of the North, but the Wild Rice, Sheyenne, Maple and Rush Rivers in North Dakota and the Buffalo River in Minnesota also cross the study area. Fargo and Moorhead are on the west and east banks, respectively, of the Red River of the North approximately 453 river miles south of the mouth of the river at Lake Winnipeg in Manitoba, Canada. The drainage area of the Red River of the North above the U.S. Geological Survey gauging station at Fargo is approximately 6,800 square miles, of which about 2,175 square miles do not contribute to runoff.

Average annual flood damages in the Fargo-Moorhead metropolitan area are estimated at more than \$22 million (Fargo-Moorhead and Upstream Feasibility Study, Phase 1 report, Corps of Engineers, September 2005). The Fargo-Moorhead metropolitan area has a relatively high risk of flooding. The highest river stages usually occur as a result of spring snowmelt, but summer rainfall events have also caused significant flood damages. The Red River of the North has exceeded the National Weather Service flood stage of 17 feet in 49 of the past 105 years, and every year from 1993 through 2007. The study area is between the Wild Rice River, the Sheyenne River, and the Red River of the North; interbasin flows complicate the hydrology of the region and contribute to extensive flooding.

Fargo and Moorhead have become accustomed to dealing with flooding. Sufficient time is usually available to prepare for flood fighting because winter snowfall can be monitored to predict unusual spring runoff. Both communities have well documented standard operating procedures for flood fights. Both communities avoided major flood damages in the historic flood of 1997 by either raising existing levees or building temporary barriers. Since the 1997 flood, both communities have implemented mitigation measures, including acquisition of almost 100 floodplain homes, raising and stabilizing existing levees, installing permanent pump stations, and improving storm sewer lift stations and the sanitary sewer system. Although emergency measures have been very successful, they may also contribute to an unwarranted sense of security that does not reflect the true flood risk in the area.

c. Primary Objective:

- To develop an implementable plan for flood damage reduction for the Fargo-Moorhead Metropolitan Area.

Secondary Objectives and Outputs:

- Preserve and protect historic and cultural properties within the project area.
- Restore or improve degraded riverine and riparian habitat in and along the Red River of the North, Wild Rice River (North Dakota), Sheyenne River (North Dakota), and Buffalo River (Minnesota).
- Additional items will be developed early in the study.

These objectives will be further refined and quantified as part of the plan formulation. Conflicts between objectives will be resolved through this process.

d. The primary product of this feasibility study will be a Feasibility Report and associated NEPA documents that will focus on a flood damage reduction project for the Fargo-Moorhead

Metropolitan Area. It is important to understand that the development of a plan does not mean a justified Federal project will be identified.

The study team will work together to complete a three-phased plan formulation process and to document that planning effort via a Feasibility Report and associated Environmental Impact Statement. The primary focus of this formulation is to define a Federal flood damage reduction project. The secondary outputs of the project formulation will be to evaluate National Ecosystem Restoration (NER) and recreation outputs that could be integrated into the Federal project.

The steps included in the study will involve problem and opportunity identification, inventory, evaluation, screening alternatives, risk informed decision making, determining the Optimized /National Economic Development (NED) plan, identification of (if different from the NED plan) a Locally Preferred Plan (LPP), designing and costing of the recommended plan, determining and disclosing the environmental effects of the recommended plan, and documentation of the economic feasibility of a recommended plan. These study efforts will be documented in a Screening Letter Report (Phase 1 of the study), a Draft Feasibility Report and Environmental Impact Statement (Phase 2 of the study), and a Final Feasibility Report and Environmental Statement (Phase 3). The format, level of detail, planning procedures used and the content of feasibility report will generally follow Corps guidance contained in ER1105-2-100.

3. Product Delivery Team (PDT). The St. Paul District, Corps of Engineers, the City of Fargo, North Dakota and the City of Moorhead, Minnesota are jointly conducting this study. The Corps' project manager, Aaron Snyder, is the primary point of contact for this project. Contact the project manager by telephone at (651) 290-5489 for information about this project. The point of contact for the PCX is Eric Thaut, Flood Risk Management PCX Director. He can be reached at (415) 503-6852. The team is multidisciplinary and consists of members from nearly all Corps disciplines. Coordination between the PDT and the Flood Risk Management Center of Expertise will be ongoing throughout the study. See Appendix A for a list of team members.

4. Methodology and Model Certification.

a. EC 1105-2-407 provides the following definition of a planning model:

“any models and analytical tools that planners use to define water resources management problems and opportunities, to formulate potential alternatives to address the problems and take advantage of the opportunities, to evaluate potential effects of alternatives and to support decision-making.”

b. The computational models to be employed in the Fargo-Moorhead Metro Study have either been developed by or for the USACE. More specifically, the models to be employed in the completion this feasibility study are:

- MCACES: This is a cost estimating model that was developed by Building Systems Design Inc. The Army Corps of Engineers began using this model in 1989.

- HEC-FDA: This model, developed by the Corps' Hydrological Engineering Center, will assist the PDT in applying risk analysis methods for flood damage reduction studies as required by, EM 1110-2-1419. This program:
 - Provides a repository for both the economic and hydrologic data required for the analysis
 - Provides the tools needed to understand the results
 - Calculates the Expected Annual Damages and the Equivalent Annual Damages
 - Computes the Annual Exceedence Probability and the Conditional Non-Exceedence Probability
 - Implements the risk-based analysis procedures contained in EM 1110-2-1619
- HEC-RAS (Engineering Model): The function of this model is to complete one-dimensional hydraulic calculations for a full network of natural and man made channels. HEC-RAS major capabilities are
 - User interface
 - Hydraulic Analysis
 - Data storage and Management
 - Graphics and reporting

c. If modeling is required for assessing ecosystem restoration features, habitat outputs will be assessed and derived primarily using the Habitat Evaluation Procedures (HEP) developed by the U.S. Fish and Wildlife Service and other agencies. An area can have various habitats and the habitats can have different suitabilities for species that may occur in that area. The suitabilities can be quantified (via Habitat Suitability Indices, or HSIs). The overall suitability of an area for a species can be represented as a product of the areal extent of each habitat and the suitability of the habitats for the species.

1) As habitat changes through time, either by natural or human-induced processes, we can quantify the overall suitability through time by integrating the areal extent-suitability product function over time. Thus, we can quantitatively compare the forecasted future without-project condition to future conditions with alternative plans

2) The Habitat Evaluation Procedures (HEP) is an established approach to assessment of natural resources. The HEP approach has been well documented and is approved for use in Corps projects as an assessment framework that combines resource quality and quantity over time, and is appropriate throughout the United States. The Habitat Suitability Index (HSI) models are the format for quantity determinations that are applied within the HEP framework. The following guidelines are provided to help determine the need for certification. ATR of input data is required in all instances.

- New HSI models developed by the Corps are subject to certification.
- Published HSI models, while peer-reviewed and possibly tested by the developers, are subject to review and approval by the Ecosystem Restoration Planning Center of Expertise (ECO-PCX).
- Modifications to published HSI models, where relationships or formulas are changed, are subject to certification.

3) Cost effectiveness and incremental cost analyses will be based upon the IWR PLAN program and other standard methods of analysis.

4) We do not anticipate using any environmental planning models that are not currently certified. If new HSI models are developed for use in the Fargo-Moorhead Metro Feasibility Study, we will coordinate accordingly with the ECO-PCX.

d. Model certification and approval for all identified models will be coordinated through the appropriate PCX as needed. Project schedules and resources will be adjusted to address this process for certification and PCX coordination.

5. Review and Quality Control.

a. District Quality Control (DQC) is the review of basic science and engineering work products focused on fulfilling the project quality requirements. It is managed in the home district in accordance with the MSC and district Quality Management Plans and may be conducted by staff in the home district as long as they are not involved in the study. DQC is required for all decision documents.

b. Agency Technical Review (ATR) is a critical examination by a qualified person or team outside of the home district that was not involved in the day-to-day technical work that supports the decision document. To assure independence, the leader of the ATR team shall be from outside the home Division. ATR is intended to confirm that such work was accomplished in accordance with clearly established professional principles, practices, codes, and criteria, and that recommendations are in compliance with laws and policy. ATR is required for all decision documents.

c. Independent External Peer Review (IEPR) is the most important level of review, and is applied in cases that meet certain criteria where the risk and magnitude of the proposed projects are such that a critical examination by a qualified team outside of USACE is warranted. The IEPR reviewers will be nominated and managed by an outside eligible organization (OEO) that is independent; is free from conflicts of interest; does not carry out or advocate for or against Federal water resources projects; and has experience in establishing and administering IEPR panels. The scope of the review will address the underlying planning, engineering, safety assurance, economics, and environmental analyses performed, not just one aspect of the project.

d. ATR will be ongoing throughout product development, rather than a cumulative review performed at the end of the investigation. The estimated cost for the ATR is \$110,00 and will be performed by a Corps of Engineers sister district, in coordination with the Flood Risk Management Center of Expertise and the Walla Walla District Cost Estimating Directory of Expertise. The expertise and technical backgrounds of the ATR team members will qualify them to provide a comprehensive technical review of the product. Names of ATR members and an ATR team leader will be identified from outside Mississippi Valley Division approximately three months prior to the first ATR review; the first ATR team involvement is scheduled to start in March 2009. Selection of ATR team members will be coordinated as needed with the PCX. The

ATR team will include approximately 13 individuals that fit into the disciplines listed in the following table:

Technical Review Disciplines
Recreation planning
Real Estate
Cultural resources
Economics
Environmental engineering/NEPA
Cost/value engineering
Plan formulation/team lead
Environmental/NEPA
Hydrology and hydraulics/water control
Structural engineer
Geotechnical
Electrical engineer
Mechanical engineer

1. Recreation Planning: The recreation planner will review the recreation plan developed during the planning process, this will include review of recreational benefits, unit day values, the proposed features and anticipated uses.

2. Real Estate: The Real Estate reviewer will ensure that all of the lands necessary for the project are accounted for and that the estimated costs to acquire the proper rights to those lands are accurate.

3. Cultural Resources: The Cultural Resources reviewer will be responsible for ensuring the required cultural resources investigations and SHPO, Advisory Council, and tribal coordination to comply with Section 106 of the NHPA and its implementing regulation 36 CFR Part 800, as well as ensuring that the proper information was included in the Environmental Assessment/Environmental Impact Statement.

4. Economics: The Economics reviewer will be responsible for reviewing the required economic analyses, project benefits, anticipated future costs, and residual damages for the project alternatives as well as ensuring that the proper information was included in the Environmental Assessment/Environmental Impact Statement.

5. Environmental/NEPA: The Environmental reviewer will be responsible for assessing environmental impacts, coordinating ecosystem restoration studies and ensuring the proper NEPA and cultural resource compliance activities were completed. This may include verifying any NER calculations and completion of the Fish and Wildlife Service Coordination Act requirements.

6. Cost Engineer: The cost reviewer will ensure that the estimated project costs are accurate and that the assumptions made to develop these costs were reasonable.

7. Plan Formulation: The plan formulation reviewer will ensure that the Corps planning process was followed and that the project meets all of the required planning criteria.

8. Hydraulics and Hydrology: The Hydraulics and Hydrology reviewer will ensure that the hydrologic and hydraulic analysis was properly completed and that the alternatives will actually achieve the desired water level results.

9. Structural/Mechanical/Electrical/Geotechnical: The reviewers will ensure that the designed project meets Corps standards that the quantities estimated and assumptions are reasonable. This applies to the structural features, electrical features, mechanical features and the geotechnical analysis.

e. ATR comments and responses will be recorded in the online DRChecks system (www.projnet.org). Documentation of the agency technical review will be included with the submission of the reports to Mississippi Valley Division and HQUSACE. All comments resulting from the agency technical review will be resolved prior to forwarding the feasibility study to higher authority and local interests. The report will be accompanied by a certification, indicating that the agency technical review process has been completed and that all technical issues have been resolved.

f. Value Engineering Plan. Value Engineering (VE) evaluations provide another method for ensuring quality. The goal of VE on this project is to ensure that a full array of alternatives is considered in order to maximize cost effectiveness. A VE study will be conducted during the plan formulation before the selected plan has been defined. The VE study objectives will be to build upon the design team's preliminary plan formulation efforts, clarify the functional requirements of project features, and recommend additional conceptual alternatives to meet those requirements. The same team that performs ATR will conduct the VE study with additional technical representatives from the Sponsors, and this effort will be coordinated with the St. Paul Value Engineer.

g. Quality control will also be monitored via Local Sponsor reviews, and Higher Authority/vertical team conferences and reviews. The vertical team will be involved in the plan formulation process and will be presented with information during the standard Corps checkpoints including a Feasibility Scoping Meeting, Alternatives Formulation Briefing, and the Civil Works Review Board Meeting. As with other Corps studies the team plans to use the ATR process as a way to ensure quality in the products being produced.

h. At this time no in-kind deliverables are anticipated as part of the non-federal cost share. The Sponsor will be responsible for quality control over deliverables provided as in-kind contributions. The Corps will verify that such contributions meet negotiated requirements and standards before granting cost-sharing credit for those contributions.

i. Independent External Peer Review (IEPR). This study will be subject to IEPR in accordance with Engineering Circular 1105-2-410 on the basis of project cost. The potential project cost could range from \$40 million to in excess of \$1 billion. The PDT will work with the PCX to assign the proper reviewers representing the disciplines listed in the following table.

Peer Review Disciplines
Economics
Environmental/NEPA
Hydrology and hydraulics
Structural engineer
Geotechnical Engineer
Cost Engineer

The disciplines will require similar expertise as those listed in the ATR section of this PR on page 8. The project management plan, of which this review plan is a component of, for the feasibility study currently includes \$150,000 for IEPR activities and assumes the use of relatively standard structural measures. If the scope of the project increases significantly or novel solutions are proposed, the composition of the IEPR panel and the review cost estimate will be adjusted accordingly. The PCX will administer the IEPR and ensure that the peer review is properly conducted. IEPR comments and responses will be recorded in the online DRChecks system (www.projnet.org). The PCX will instruct the OEO to prepare a Review Report that shall:

- Disclose the names of the reviewers, their organizational affiliations, and include a short paragraph on both the credentials and relevant experiences of each reviewer.
- Include the charge to the reviewers.
- Describe the nature of their review and their findings and conclusions.
- Include a verbatim copy of each reviewer's comments (either with or without specific attributions), or represent the views of the group as a whole, including any disparate and dissenting views.

The project may generate some controversy similar to other larger flood risk management plans, but the public and many state and federal agencies are expected to support the project and will participate in the project development. The plan is not anticipated to disseminate influential scientific information or scientific assessment. The plan is not likely to have significant economic, environmental, or social effects to the nation. There is potential for loss of human life depending on the recommended solution. An environmental impact statement will be developed as part of the study. The overall project has limited risks and would most likely be a very traditional flood risk management project. The comments and suggestions provided by the IEPR will be incorporated into the final feasibility report. The feasibility report, IEPR report, and responses to the IEPR will be posted on the St. Paul District website and distributed as hard copies upon request.

j. Public Review. The Corps and the project sponsor plan to conduct a number of public involvement activities during the development of the Feasibility Study. This study will incorporate public input and provide additional opportunities for public involvement. The draft feasibility report and environmental impact statement will be distributed for public review as part of the normal NEPA review process. The formal public review will be scheduled after the Alternative Formulation Briefing and before submitting the report to the Civil Works Review Board in accordance with the study schedule defined in the Project Management Plan. If significant comments are received, the information will be incorporated as necessary and additional reviews from the ATR and the vertical teams will be conducted. Public comments

would also be included in the ATR and IEPR documentation, and any significant comments would be sent to the ATR and IEPR team leads.

k. Vertical Team Coordination. St. Paul District has informed Mississippi Valley Division (MVD) of this review plan and the plan to proceed. MVD has concurred with the current approach. The MVD-RIT has been contacted regarding this plan and offered no comments. Because of the expected magnitude of this project, independent external peer review will be required.

6. Schedule. The schedule for study are shown in the following table, the schedule is subject to the availability of funds and further development of the study:

FARGO-MOORHEAD METRO FEASIBILITY STUDY		Task Start	Task End
Tasks	PHASE 1 INITIAL ALTERNATIVE SCREENING (Totals)		
1	Define Study Area	October-08	November-08
2	Identify Problems and Opportunities	October-08	November-08
3	Review Current topo and utility data	October-08	December-08
4	Develop base Hydrology and Hydraulic information	October-08	December-08
5	Identify current levels of protection	October-08	December-08
6	Credit to existing levees	November-08	January-09
7	Identify connectivity of water in system (sewers)	October-08	December-08
8	Update housing inventory	October-08	December-08
9	Brainstorm non-traditional National economic benefits and Risk Benefits	November-08	November-08
10	Identify existing condition damages	December-08	January-09
11	Hold public scoping meeting	November-08	November-08
12	Fish and Wildlife Coordination Act	December-08	July-10
13	Identify existing cultural resources information	October-08	December-08
14	Identify Future without project conditions	December-08	January-09
15	Develop initial array of possible measures/alternatives	October-08	December-08
16	Develop Initial rough cost estimate	January-09	February-09
17	Phase 1 ESA on In Town Risk Management Features	February-08	February-09
18	Conduct initial screening	February-09	February-09
19	Begin tribal, SHPO, and Advisory Council coordination	January-09	July-10
20	Form combination alternatives	February-09	February-09
21	Develop Quantities for Cost Estimate	February-09	February-09
22	Develop Programmatic Agreement for Section 106 of NHPA compliance	February-09	July-10
23	Develop rough cost estimates alternatives/measures	February-09	March-09
24	Compare costs and benefits rough estimate	February-09	March-09
25	Develop Risk Informed Decision Making information	February-09	March-09
26	Complete development of letter Report	March-09	March-09
27	Initial ATR	March-09	March-09
28	Conduct a Feasibility Scoping Meeting	April-09	April-09

	PHASE 2 ALTERNATIVE FORMULATION (Total)		
29	Hold Public Meeting	April-09	April-09
30	Compute non-traditional National Economic Benefits	April-09	June-09
31	Conduct second screening of alternatives - narrowed to 3 alternatives	April-09	June-09
32	Conduct subsurface investigations on remaining alternatives (Apr-Aug)	June-09	October-09
33	CPT Review and interpretation	June-09	October-09
34	River Soundings	April-09	May-09
35	Collect hazardous material information on remaining alternatives (Diversion)	April-09	September-09
36	Phase 2 ESA for Risk Management Corridor	June-09	August-09
37	Identify Potential Borrow Areas and Material Sources	May-09	September-09
38	Collect real estate information on the remaining alternatives	May-09	September-09
39	Collect Rights of Entry	April-09	June-09
40	Conduct initial cultural surveys on remaining alternatives	May-09	November-09
41	Conduct Cultural Survey of Diversion Alternative (30 miles * 600 feet)	May-09	December-09
42	Design 3 remaining alternatives (50, 100, 250, 500 year protection)	September-09	October-09
43	Calculate Quantities	January-10	February-10
44	Determine new costs for the remaining alternatives	October-09	October-09
45	Develop cost curves for the various alternatives based on their sizing.	October-09	October-09
46	Conduct an ATR/VE	November-09	November-09
47	Identify the most cost effective alternative; this will be the selected plan.	December-09	December-09
48	Hold Public Meeting (identify selected plan)	January-10	January-10
49	Complete development of all appendices.	March-10	April-10
50	Complete development of draft feasibility report.	March-10	April-10
51	Conduct an Alternative Formulation Briefing (tentative plan established)	April-10	April-10

	PHASE 3 DEVELOPMENT OF SELECTED PLAN (Total)		
52	Conduct geotechnical investigation to reduce uncertainties	April-10	June-10
53	Finalize design of selected plan (geotech, structures, MEA)	April-10	June-10
54	Diversion Channel Seepage and Stability	April-10	June-10
55	CPT Review and interpretation	April-10	June-10
56	Complete a feasibility level cost estimate of selected plan (respond to AFM)	June-10	July-10
57	Identify Potential Borrow Areas and Material Sources	April-10	June-10
58	Conduct Cultural Survey of borrow areas	June-10	December-10
59	Conduct National Register evaluation of 50 buildings and 3 bridges	May-10	November-10
60	Conduct National register Evaluation of 20 Archeological Sites	May-10	December-10
61	Develop a plan view and cross section drawings of the selected plan.	May-10	July-10
62	Complete appendices for all disciplines focus on selected plan	July-10	August-10
63	Complete the Environmental Impact Statement	July-10	August-10
64	Conduct an EPR	August-10	August-10
65	Develop a draft Record of Decision.	July-10	August-10
66	Submit final draft report to Corps Headquarters	August-10	August-10
67	Conduct Civil Works Review Board	September-10	September-10
68	Release the Final Draft report and Draft ROD for state and agency review.	September-10	September-10
69	Hold Public Meeting.	October-10	October-10
70	Respond to State and Agency comments.	November-10	November-10
71	Finalize the report and sign the Record of Decision.	December-10	December-10
72	Release the Final report ROD.	December-10	December-10
73	Congress Authorized the Project	December-10	December-10
74	Begin Plans and Specifications/Construction.	January-11	January-11
	Ongoing		
	Sponsor Review and Review Meeting Participation	October-08	January-11
	MISC S&A	October-08	January-11
	Travel	October-08	January-11